

NASA's Return on Investment Report

Issue 4

December 2011



This bi-monthly newsletter of accomplishments, progress, and happenings in NASA's commercial spaceflight development programs is distributed by the Commercial Spaceflight Development Division at NASA Headquarters.

COMMERCIAL ORBITAL TRANSPORTATION (COTS) PARTNERS ADJUST LAUNCH SCHEDULES, BUT TECHNICAL PROGRESS CONTINUES

Both of NASA's COTS partners continue to make technical progress toward developing and demonstrating their cargo transportation capabilities. However, schedules for their demonstration flights have been delayed from the original aggressive targets.

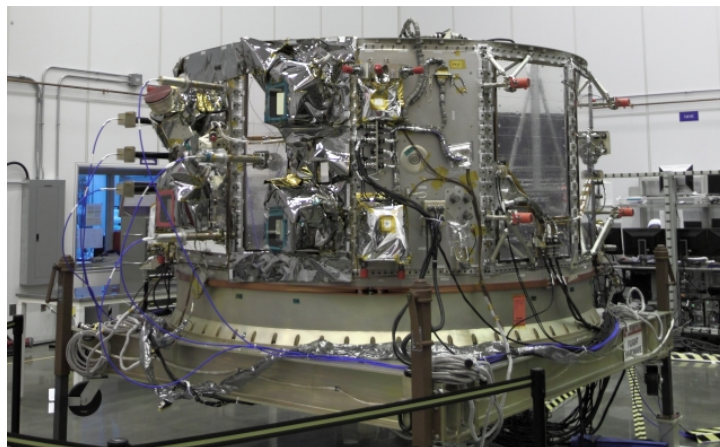
When NASA signed the original Space Act Agreement (SAA) with Space Exploration Technologies (SpaceX) in August 2006, their first, second and third COTS demonstration flights were planned for September 2008, June 2009 and September 2009 respectively. SpaceX successfully flew the first demonstration mission in December 2010, launching a Dragon capsule into orbit on a Falcon 9 rocket and recovering it off the coast of California. NASA announced on December 9th that SpaceX's next COTS demonstration flight is now targeted for February 7th (reference press release 11-413).

SpaceX continues to make steady technical progress toward this flight. Currently, all flight vehicle elements are at Cape Canaveral for launch, and all qualification and acceptance testing is complete. SpaceX is in the final stages of the safety review process and has begun International Space Station (ISS) integrated software stage testing with NASA, the final major activities required to clear the way for the Demonstration Mission. A third SpaceX COTS demonstration mission may not be necessary if all ISS rendezvous and berthing objectives are accomplished successfully on the next flight.



*SpaceX Dragon capsule at launch site processing facility.
Photo courtesy of SpaceX.*

Orbital Sciences Corporation's (OSC) schedule has seen similar shifts. When NASA signed the original SAA with OSC in February 2008 to demonstrate their Cygnus cargo vehicle, the demonstration flight was originally planned for December 2010. Currently, Orbital is planning the maiden launch of their newly named Antares launch vehicle (previously referred to as "Taurus II") in late February or March 2012, and the COTS demonstration flight to the ISS in April. NASA amended the OSC SAA last year to add a risk-reduction test flight of OSC's launch vehicle prior to the Cygnus Demonstration flight. At present, the initial Antares launch vehicles are being integrated at the Wallops Flight Facility (WFF) in Virginia. The engines were recently mounted to the first stage in preparation for integrated vehicle hot fire testing on the launch pad. The new launch complex at WFF is nearly complete and is the pacing item for the upcoming test firing and demonstration flights.

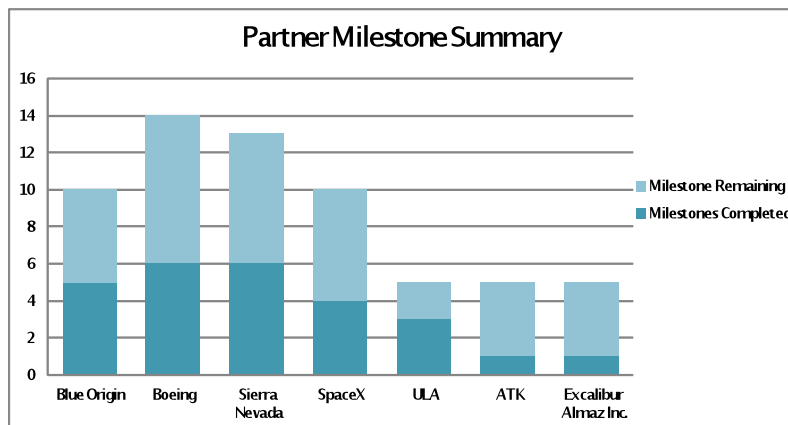


Orbital Cygnus Service Module. Photo courtesy of Orbital Sciences Corp.

The schedule delays experienced by our partners over the life of the COTS Program are indicative of the challenges associated with developing and flying new, highly complex launch vehicles and spaceflight systems. NASA is working with both COTS Partners to facilitate their development activities and overcome schedule issues. However, safe spaceflight is the primary objective, not schedule. Also, the addition of the final Shuttle mission (STS-135) gave the ISS the flexibility to maintain a six-person crew into FY 2013 without any commercial cargo flights.

COMMERCIAL CREW PARTNERS CONTINUE TO MEET MILESTONES

NASA's industry partners continue to demonstrate design and development progress for their commercial crew transportation systems. During the past two months, five more SAA milestones and one formal interim step for a future milestone were accomplished on the road to eventual commercial space transportation services. In total over the past eight months, NASA's Commercial Crew Development Round 2 partners have completed 26 of the 62 planned milestones. (Five planned milestones were added since our last Return on Investment Report due to the new partnership with Excalibur Almaz, Inc. See the following article.)



The Sierra Nevada Corporation (SNC) successfully completed the System Definition Review for their Dream Chaser spacecraft. This major design maturation event, which took place over a period of three months, enabled SNC to assess how their design will meet low Earth orbit (LEO) transportation mission needs. Additionally, SNC successfully activated their Flight Control Integration Laboratory, which will test the Dream Chaser's electronic and mechanical hardware that controls the vehicle's flight path and attitude. The initial lab system was built to be adaptable, and will first be used to test actuators and control surfaces in preparation for an unpiloted free-flight test scheduled for next year.

Boeing successfully completed wind tunnel testing of a scale model of their CST-100 spacecraft to measure aerodynamic factors during ascent to low Earth orbit (LEO) and emergency aborts. The data will improve computer models and analysis tools for further CST-100 design maturation and eventual certification. Additionally, Boeing accomplished an important step for their upcoming Emergency Detection System (EDS) testing milestone by completing design of the software needed to interface

between the CST-100 systems and the launch vehicle's EDS. They also verified the test plan for the EDS simulation early next year. An EDS is critical during human launches, as it provides an early warning of problems that could require a launch abort. For this work, Boeing obtained a prototype Atlas V EDS emulator from United Launch Alliance (ULA) and is providing ULA with feedback that will help improve the EDS system. ULA is working on their EDS system under a separate unfunded SAA with NASA, so this interim milestone progress is a great example of cooperation between industry partners.



Boeing's Wind Tunnel testing of the CST-100 at NASA's Ames Research Center. Photo courtesy of the Boeing Company.

ULA completed the tailored Systems Requirements and Design Review for developing a human-rated version of their existing Atlas V expendable rocket. The review included their program's status, certification planning, requirements, and baseline conceptual design.

A summary schedule showing all completed and planned CCDev2 milestones can be found at: <http://www.nasa.gov/exploration/commercial/>.

NASA AND EXCALIBUR ALMAZ, INC. FORM NEW PARTNERSHIP

As part of Commercial Crew Development Round 2 activities, NASA and Houston-based Excalibur Almaz, Inc. (EAI) have entered into a new agreement for collaboration on furthering the development of EAI's spacecraft concept for low Earth orbit crew transportation. The agreement is an unfunded SAA, which means that NASA will provide limited technical support to EAI but no funding.

"We are pleased to add Excalibur Almaz to the group of CCDev2 companies and look forward to a productive partnership," said Brent Jett, Commercial Crew Program deputy manager.

EAI's concept for commercial crew transportation to the International Space Station is to use the company's planned tourist space vehicle in concert with an intermediate stage, and to launch on a commercially available rocket to be determined in the near future.

As part of this agreement, EAI will conduct reviews of their systems requirements, compatibility with potential launch vehicles, spacecraft testing plans and overall design plan status. NASA will participate in these reviews by providing expert feedback based on 50 years of spaceflight experience. NASA and EAI kicked-off these activities in late October, and scheduled milestones will continue through May 2012.

A copy of the Agreement has been posted to the Kennedy Space Center Procurement website at: <http://procurement.ksc.nasa.gov/index.htm>.



Artist's rendering of EAI's Space Tourism Vehicle Concept. Image courtesy Excalibur Almaz, Inc.

For more information on any of the articles in this report, contact Michael Braukus in NASA's Public Affairs Office at 202-358-1979.

Stay tuned for future editions of the *Return on Investment*. In the meantime, feel free to review some of NASA's other commercial space accomplishments at:

<http://www.nasa.gov/exploration/commercial/>.